

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Standard Operating Permit Condition XIII – Coal Fired Boilers

**Permit Condition for Air Quality Permits
Adopted by Reference in 18 AAC 50.346**

April 1, 2002

Revised August 20, 2008

Standard Operating Permit Condition XIII – Coal Fired Boilers

Stationary Source Categories This Condition Applies to: Coal fired boilers in operation before July 1, 1972.

The department will use standard permit condition XIII in an operating permit unless the department determines that emission unit or stationary source specific conditions more adequately meet the requirements of 18 AAC 50.

Circumstances where emission unit or stationary source specific conditions more adequately meet 18 AAC 50 include:

1. the permittee demonstrates that Continuous Opacity Monitoring System (COMS) operation and audit procedures that are specific to the COMS unit being used and that differ from this standard permit condition XIII are more appropriate.

Permit Wording:

1. **Coal Fired Boiler Visible Emissions Monitoring – Procedures for Operation of a COMS.** The following procedure applies to monitoring visible emissions using a Continuous Opacity Monitoring System (COMS):
 - 1.1 the COMS must meet the performance specifications in 40 C.F.R. 60, Appendix B, Performance Specification 1, adopted by reference in 18 AAC 50.040(a);
 - 1.2 operate and maintain the COMS in accordance with the manufacturer's written requirements and recommendations;
 - 1.3 except during COMS breakdowns, repairs, calibration checks, and zero and upscale adjustments, complete one cycle of sampling and analyzing for each successive 10-second period of emission unit operation; from this data, calculate and record the average opacity for each successive one-minute period;
 - 1.4 at least once daily, conduct a zero and upscale check in accordance with 40 C.F.R. 60.13(d), adopted by reference in 18 AAC 50.040(a), and a written procedure; adjust whenever the zero or upscale drift exceeds four percent opacity in a 24-hour period;
 - 1.5 conduct performance audits as follows:
 - a. for a COMS that was new, relocated, replaced, or substantially refurbished on or after April 9, 2001, perform an audit that includes the following elements as described in the department's *Performance Audits for COMS*, adopted by reference in 18 AAC 50.030, at least once in each 12 months:
 - (i) optical alignment;

- (ii) zero and upscale response assessment;
 - (iii) zero compensation assessment;
 - (iv) calibration error check; and
 - (v) zero alignment assessment;
- b. for a COMS that was new, relocated, replaced, or substantially refurbished before April 9, 2001, perform the same audits required under condition XIII.1.5a, except that condition XIII.1.5a(i) - XIII.1.5a(iv) must be performed at least quarterly; this frequency may be reduced if
- (i) the permittee demonstrates, by applying measurable criteria to the results of quarterly audits, that quarterly audits are not necessary; and
 - (ii) the department gives written approval for the reduction in frequency.

2. Coal Fired Boiler Particulate Matter (PM). The permittee shall not cause or allow particulate matter (PM) emitted from *<identify emission units>* to exceed 0.1 grains per cubic foot of exhaust gas corrected to standard conditions and averaged over three hours. (18 AAC 50.055(b))

2.1 Coal Fired Boiler PM Monitoring and Recordkeeping. The permittee shall do the following.

- a. at least once every 12 months, for each boiler that has operated 90 days or more during that period, inspect the exhaust duct work and the internal components of the dust collector for the presence of leaks; prior to restarting the boiler, repair all leaks in the exhaust ductwork and all leaks that would allow dirty gas to pass into the clean gas side of the dust collector;
- b. conduct source tests for particulate matter as follows:
 - (i) conduct the tests and report the results in accordance with conditions *<insert conditions' numbers that address the requirements of 18 AAC 50.220 and that reiterate 18 AAC 50.345(l) - (o)>*; for tests required under condition XIII.2.1b(iii), submit the test plan as required by *<insert condition number that reiterates 18 AAC 50.345(m)>* and at least 60 days before the deadline for the next test under condition XIII.2.1b(iii);
 - (ii) conduct an initial test on each boiler within 8760 operating hours or two calendar years, whichever is sooner, after the issue date of the initial operating permit;

- (iii) conduct additional tests on each boiler according to the following schedule where each test means a three hour average consistent with 18 AAC 50.220(f):
 - (a) if the most recent source test exceeded 90 percent of the emission standard, conduct a source test within 8760 operating hours of the previous test;
 - (b) if the most recent source test exceeded 75 percent of the emission standard, conduct a source test within 17520 operating hours of the previous test; and
 - (c) within five years of the previous source test, conduct a test of each boiler operated during that time;
- (iv) for any boiler with a steam production limit that the operator wishes to change, the operator may operate in excess of the steam limit to perform source tests on which a new limit would be based; the operator may use a new limit based on the source testing if
 - (a) the permittee submits a source test plan and the department approves the plan in writing;
 - (b) the permittee conducts source testing according to the source test plan and consistent with condition *<insert conditions' numbers that address the requirements of 18 AAC 50.220>*;
 - (c) the permittee submits the results to the department;
 - (d) the test results show compliance at the requested new steam production rate; and
 - (e) the department concurs with the new limit in writing, after finding that
 - i) the test results will be representative of normal operation; and
 - ii) the new limit does not cause the facility to be subject to permitting under 18 AAC 50.300(h);
- (v) during each test, measure and record visible emissions and steam production rates; submit the records with the source test report; determine visible emissions consistent with monitoring methods of condition *<insert applicable condition number from this permit>* for the duration of each one hour run;

- c. measure and record steam production as follows:
 - (i) operate and maintain a device to measure and record steam production in accordance with the manufacturer's written requirements and recommendations;
 - (ii) except during breakdowns, repairs, calibration checks, and zero and span adjustments of the device, complete at least one cycle of sampling and analyzing for each successive 15-minute period of boiler operation; from this data, calculate and record the average steam production rate for successive one-hour periods; maintain this data at the facility and make it available to the department upon request;
 - (iii) within one year after the effective date of this permit and at such times as the department may require, determine the relative accuracy of each monitoring device required by condition XIII.2.1c(i);
 - (iv) keep sufficient written records to show compliance with the requirements of this condition XIII.2.1; in addition, keep records of the date and time identifying each period during which a device required by this permit is inoperative, except for zero and span checks, and records of the nature of device repairs and adjustments; upon request of the department, submit copies of the records.

2.2 Coal Fired Boiler PM Reporting. The permittee shall

- a. submit a report in accordance with *<insert standard permit condition number concerning excess emissions and permit deviation reports>* whenever any of the following situations occur:
 - (i) when steam production exceeds a permit limit;
 - (ii) when the results of a source test exceed the particulate matter emission limit;
 - (iii) if a steam production monitoring device malfunctions or becomes inoperable for four or more consecutive hours; in the report, identify the boiler, the cause of failure, and the anticipated time required to repair the device;
- b. include in each operating report under condition *<insert standard permit condition number concerning operating reports>*:
 - (i) the results of each particulate matter source test;

- (ii) for any boiler with a steam production limit, the limit and averaging period, the highest steam production rate for the period covered by the report (averaged over the same averaging period as the limit), and identification of any periods exceeding the limit; and
- (iii) the results of any relative accuracy determination of steam monitoring equipment.

3. Sulfur Compound Emissions. The permittee shall not cause or allow sulfur compound emissions, expressed as sulfur dioxide, from emission units *<identify coal fired boilers>* to exceed 500 parts per million averaged over a period of three hours. (18 AAC 50.055(c))

3.1 CFB Sulfur Compound Emissions Monitoring. The following applies to sulfur compound emission monitoring:

- a. upon receipt of each shipment of fuel at the stationary source, the permittee shall
 - (i) obtain a signed statement from the supplier with the following information:
 - (a) the percent sulfur by weight of the coal;
 - (b) the method of analysis; and
 - (c) a statement that the analysis was representative of the coal shipped;
 - (ii) if valid representative results are not available from the supplier, analyze a representative sample of the fuel to determine the sulfur content using ASTM D2492-90 for coal, adopted by reference in 18 AAC 50.035(c), or another method approved in writing by the department for coal or other fuels; and
 - (iii) if the coal contains more than 0.4 percent sulfur by weight, calculate the three hour exhaust concentration expected to result from combusting each shipment of fuel using the following equation:

$$\text{SO}_2\text{-concentration, PPM} = 1.00 \times 10^6 \times \text{mol-SO}_2 / (\text{mol-SO}_2 + \text{mol-CO}_2 + \text{mol-O}_2 + \text{mol-N}_2)$$

Where:

$$\text{mol-SO}_2 = [\text{wt\% Sulfur}_{\text{fuel}}, \%] / 32.06$$

$$\text{mol-CO}_2 = [\text{wt\% Carbon}_{\text{fuel}}, \%] / 12.01$$

$$\text{mol-O}_2 = \text{MF} \times (([\text{wt}\% \text{Nitrogen}_{\text{fuel}}, \%] / 28.01) + (4.76 \times \text{mol-SO}_2) + (4.76 \times \text{mol-CO}_2) + (1.88 \times \text{mol-H}_2\text{O}) - (3.76 \times ([\text{wt}\% \text{Oxygen}_{\text{fuel}}, \%] / 32.00)))$$

$$\text{MF} = ([\text{vol}\% \text{O}_2, \text{exhaust}, \%] / (100\% - 4.76 \times [\text{vol}\% \text{O}_2, \text{exhaust}, \%]))$$

$$\text{mol-H}_2\text{O} = [\text{wt}\% \text{Hydrogen}_{\text{fuel}}, \%] / 2.016$$

$$\text{mol-N}_2 = ([\text{wt}\% \text{Nitrogen}_{\text{fuel}}, \%] / 28.01) + (3.76 \times \text{mol-SO}_2) + (3.76 \times \text{mol-CO}_2) + (1.88 \times \text{mol-H}_2\text{O}) + (3.76 \times \text{mol-O}_2) - ([\text{wt}\% \text{Oxygen}_{\text{fuel}}, \%] / 8.51);$$

And Where:

The fuel weight percent (wt%) of carbon, nitrogen, oxygen, and hydrogen is obtained from the most recent analysis required by condition XIII.3.1b;

The volume percent of oxygen in the exhaust (vol% O_{2, exhaust}) is obtained from oxygen meters on a three hour average or from the most recent ORSAT analysis at the same boiler load used in the calculation; and

The fuel weight percent (wt%) of sulfur is obtained pursuant to condition XIII.3.1a(i) or XIII.3.1a(ii);

- b. at least once each year, and whenever a shipment of coal contains more than 0.4 percent sulfur, obtain a representative sample of each fuel that is burned using the applicable procedures in 40 C.F.R. 60, Appendix A-7, Method 19, Section 12.5.2.1, adopted by reference in 18 AAC 50.040(a); conduct an ultimate analysis of the representative sample using ASTM D3176-89 (1997), adopted by reference in 18 AAC 50.035(c), or another method approved in writing by the department to determine the weight percents, dry basis, of carbon, nitrogen, oxygen, and hydrogen;
- c. conduct source tests on at least one coal fired boiler at the stationary source to determine sulfur compound emissions while burning each shipment of fuel if the calculations of condition XIII.3.1a(iii) show that the exhaust SO₂ concentration would exceed 500 ppm.

3.2 **CFB Sulfur Compound Emissions Record Keeping.** The permittee shall keep records of the sulfur contents of each shipment of fuel, each calculated SO₂ concentration averaged over three-hours, and any test results and calculations determined under condition XIII.3.1.

3.3 **CFB Sulfur Compound Emissions Reporting.** The permittee shall

- a. submit a report in accordance with condition *<insert standard permit condition number concerning excess emissions and permit deviation reports>* whenever
 - (i) a three-hour exhaust concentration calculated pursuant to condition XIII.3.1a(ii) is greater than 500 ppm; or
 - (ii) a source test pursuant to condition XIII.3.1c has not shown compliance;
- b. include in each operating report under condition *<insert standard permit condition number concerning operating reports>* a summary that includes
 - (i) sulfur contents of each shipment of fuel;
 - (ii) each calculated SO₂ concentration averaged over three hours; and
 - (iii) any test results and calculations required under condition XIII.3.1.

The following apply to this standard permit condition:

1. **Opacity.** The standard conditions for visible emissions apply only to technical aspects of operating the COMS, including audits. The permit will state the applicable opacity limit, and emission unit specific conditions will be used for all other aspects of monitoring, record keeping, and reporting for the opacity standards of 18 AAC 50.055(a)(1) and (a)(9).
2. Conditions XIII.2.1b(iv) and XIII.2.1c and the reference to steam production rates in condition XIII.2.1b(v) for each coal fired boiler will be used unless the department finds that
 - the boiler does not have a steam production limit; and
 - it is not feasible to operate the boiler at a steam production rate sufficiently higher than the rated steam production capacity that the particulate matter standard or opacity standard could be violated.
3. The fuel sulfur threshold in conditions XIII.3.1a(ii) and XIII.0 were calculated for the general case based on six percent excess air. That threshold will be used unless the applicant shows that the boiler must use a specific higher amount of excess air.
4. If fuel is burned that has a substantially higher ash content than normal run of mine coal, the allowable fuel sulfur must decrease proportionally with the portion of the coal that is combustible in order to assure compliance with the 500 ppm SO₂ standard. The permit should require the calculation under condition XIII.3.1a(ii) if it is foreseeable that the facility will burn fuel with an ash content greater than 15 percent and a sulfur content between 0.25 percent and 0.4 percent.